SOFT SYSTEMS METHODOLOGY AND AHP TO DEVELOP A CONCEPTUAL MODEL FOR HUMAN CAPITAL MANAGAMENT IN MEXICAN LODGING SMEs

Núñez-Ríos Juan Enrique[1],Tejeida-Padilla Ricardo[2], Badillo-Piña Isaías[3], Morales-Matamoros Oswaldo[4], Sánchez-García Jacqueline Yvette[5], Moreno-Escobar Jesús Jaime[6]

[123456] Instituto Politécnico Nacional, México
[12345]Grupo de Investigación en Sistémica y Turismo
nurje@me.com[1], rtejeidap@ipn.mx[2], ibadillop@ipn.mx[3],
omoralesm@ipn.mx[4], jacyves@icloud.com[5], jaimemor1979@yahoo.com.mx[6]

ABSTRACT

The lodging SMEs operate in a dynamic environment where aspects such as turbulence and information asymmetry undermine them compared to large enterprises. On this matter, it is considered that Human Capital Management is relevant to overcome deficiencies, delays in operations and to ensure the permanence of the organisation. However, these human activity systems (HAS) lack of a systemic model that contributes to the achievement of such an end. This paper presents a perspective on this matter, from the Systems Thinking. The Soft Systems Methodology was used, obtaining as finding a conceptual model that considers the heterogeneity in lodging SMEs problems and the human capital management. The model was verified through the Analytic Hierarchy Process, that helped to find congruence between what had been proposed from the Systems Thinking and reality, enabling its conduction towards a viable equilibrium state in its current environment. Personnel with managerial functions can benefit from an approach that pursues systemic solutions and the transcendence of the whole system like the one mentioned.

Keywords: Systems Science, Soft Systems Methodology, AHP, Lodging SMEs, Human Capital Management.

INTRODUCTION

The tourist activity is vital for many economies in Latin America, regarding to its importance, Núñez-Ríos *et al.* (2015) and Vargas & Olivares (2012) they agree that the relevance of this activity is set in terms of participation in the economy of a country, as well as its ability to generate jobs.

In Mexico's case, tourism has a positive influence on its economy because it generates income, creates jobs, increases public revenues and encourages entrepreneurial activity (CNET, 2016). It is considered to be an element of progress since it can generate relations with more than 50 productive activities, this represents opportunities for Small and

Medium-sized enterprises (SMEs) to be linked through productive chains and contribute to the welfare of the receiving communities (SECTUR, 2015). In that brief context lodging activity highlights that, according to Molina *et al.* (2014) and Ruiz *et al.* (2012), is one of the most important for the development of the tourism sector. The efficient operation of the mentioned organisations, in a complex environment, requires applying mechanisms that enables them to continue participating in the market. On this matter, this Human Activity System (HAS) must be capable of generating the necessary readjustments to survive and self-organise with self-constructive properties (García & Saavedra, 2014; Gershenson, 2015).

In the context of tourism, SMEs oriented to lodging service (lodging SMEs) can be treated as open systems and, on this basis, to understand that given the relations with its environment, and to its organisational configuration based on centrality, tend to entropy and insufficiency (Crnogaj *et al.*, 2014). On this idea, it is possible to mention that economic, political or social conflicts can affect its operations and their homeostatic level. In its internal dimension, the organisational constraints, inconsistency between planning and action poorly executed to satisfy customers or a Human Capital Management (HCM) deficient that does not help the company meets its objectives efficiently or its adaptation process.

This paper presents a conceptual model that grants lodging SMEs to develop its responsive capabilities and adapt to continuous disruptions of the environment, considering staff as an essential component.

DIFFICULTIES IN THE HUMAN CAPITAL MANAGEMENT IN THE CONTEXT OF LODGING SMES

Authors such as Feria & Hidalgo (2012) and Sánchez *et al.* (2016), indicate that lodging SMEs exhibit structural pathologies that decrease their adaptation capacity to a heterogeneous environment. In that sense, Rivera & Pérez (2013) infer that low investment level in technology, the almost void generation, application and transfer of scientific knowledge place these SMEs in at disadvantage when not being capable of using the generated data to be more productive.

According to Velázquez (2013), the most frequent problems in SMEs relate to operational and management aspects, which represent 45% closure's causes. To the above, in reference to lodging SMEs, aspects such as the low associativity of the employees towards the organisation, negative rotation, employees with low educational level, training that does not respond to the real needs of training are added.

As for the HCM, it is stressed that the current model used in the mentioned organisations does not generate synergy to fulfil objectives (Fernández *et al.*, 2006; Rojas *et al.*, 2015). Another problem that these organisations possess is, according to Pacheco *et a.l* (2012) and Iborra & Dasí (2012), the lack of ability to adapt to the environment, as well as establish

teams able to efficiently respond to pressures in the short term, looking for change, innovation, and flexibility. For Rok (2012) the hotel activity has negative elements such as extensive and irregular schedules, low salary, few growth opportunities and high levels of pressure, aspects that in its set make the HCM difficult.

At this point, it is possible to say that dealing with problems faced by lodging SMEs could occur using rigid or flexible models. The first are considered utilitarians, because the employee is considered to be a mere resource that must be controlled, it also seeks to maintain low operating costs flocking to low pay and long hours, to achieve organisational goals. In contrast the flexible models, according to Page & Connell (2009) and Mobus & Kalton (2015), they tend to be homocentric and the man is considered an asset that must be helped to pursue its development. Therefore, it is considered that this perspective is pertinent to be applied in lodging SMEs.

Therefore, it is established that to influence the HCM in lodging SMEs requires the application of a systemic view, based on a model that makes possible to understand the management of the whole organisation, to fix and to explain recursion levels among subsystems, as well as to raise a logical rearranging among subsystems in order to develop the capacities of employees (Rok y Mulej, 2014).

Soft Systems Methodology for developing a conceptual model for the human capital management

The Soft Systems Methodology (SSM) allows to generate integral approaches, as its development brings together two major dimensions: activities related to the real world and those relating to systems thinking (Checkland, 2000; Romero *et al.,* 2015; Skyttner, 2006). In this work stages 1-4 were developed as follows:

Stages 1 and 2, *problem situation (unstructured and expressed)*: there were identified elements related to the problem situation as well as the levels at which they can interact to improve the HCM and, subsequently, the conflicting relations.

Stage 3. Root definition of relevant systems: the CATOWE mnemonic granted to identify the required elements to model the HCM and, on this basis, to name the relevant systems. It is necessary to clarify that the term "relevant" does not imply that the selected system is transcendental; however, to implement it should be modelled. Based on the CATOWE, the following table shows the relevant systems:

Table 1. Relevant systems and its dimensions

Relevant System	Operational definition	Organisational dimension
Operative Activity System (OAS)	Integrated for the HCM as a regulatory element to ensure technical efficiency, a review system that detects omissions as close to their point of origin, enabling staff to implement corrections and allow the development.	Equifinality
		Homeostasis
		Asociativity

Technical and coordination system (TECS)	It seeks, through control and information storage, reduce organisational boundaries, facilitate interdependence and coordination of tasks.	Teleology
		Feedback
		Organisational climate
Auditing and Monitoring System (AMS)	Responsible for checking the subsystems, monitor significant changes, foresee for operational failures, generate and maximize the information to make decisions and implement the necessary adaptations.	Control
		Coordination
		Recurrence
General Management and Strategic Planning System (GMSPS)	Must seek to promote balance, govern the rest of the systems, combine the social and technical attributes and introduce diversity into the organisation by multifunction devices.	Autopoiesis
		Mutualist symbiosis
		Decision-making process

Stage 4. Conceptual model of relevant systems: it is set as "the must be" in order to positively influence the problem. These abstractions should result in the expression of the minimum number of activities necessary to generate a transformation process. The figure 1 shows the proposed relations to relevant systems:

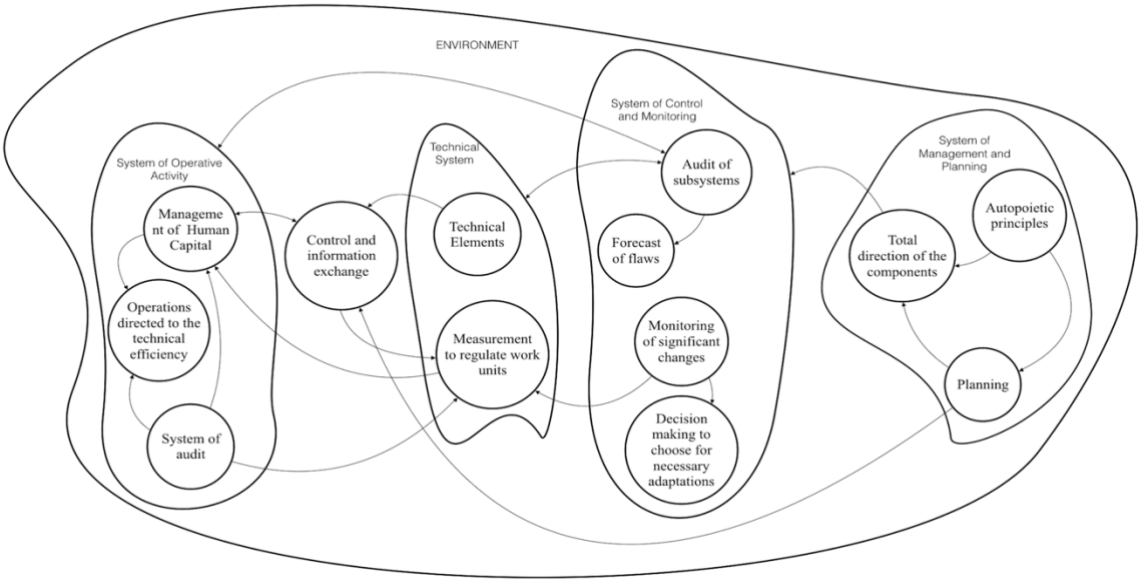

Figure 1. Conceptual model based on relevant systems

The relevant systems were divided into systemic dimensions, that exercise was aimed at generating a series of indicators and designing a questionnaire. The questionnaire aimed to

gather information, among human capital managers, with respect to relevant systems that integrate the proposal to improve the HCM in lodging SMEs and with that feedback provide enhancements to the same. The instrument contained four sections, each one corresponding to an specific relevant system. Every section contained 36 items in which managers had to express their preference or what they considered most important between option A or B, the above using the scale proposed by Saaty.

With respect to the sample, collaboration with lodging SMEs in Oaxaca city was established. In this regard, the group of experts technique was used to determine the appropriate number of actors to consult. On not having identified a standardized form for such purpose, this action is justified in authors like Dalkey *et al.* (1970); Aslani *et al.* (2012) Battistoni *et al.* (2013); Hung & Fung (2013) and De Felice *et al.* (2015); those who indicate that participants may range from 7 to 30. Therefore, the group of experts was formed by 10 human capital managers. Data collection took place by applying an instrument that considered all relevant systems named in the conceptual model. Its reliability was determined with concepts of the International Encyclopedia of Systems and Cybernetics (François, 2004) and the adaptation of items already validated of the Handbook of Organization Measurement (Price, 1997).

Applying AHP to validate de conceptual model

Dealing with unstructured problems tend to be difficult since the whole context it is not known as well as the consequences of influence on this. According to Saaty & Vargas (2012) and Jiang (2014), the AHP is an alternative to deal with this kind of problems, since it allows to transform a multi-dimensional problem (multicriteria) into one of one-dimensional scale (of priorities). Thus, a complex variable can be divided into more simple elements simulating the process in which the human brain breaks down something to deal with diversity. Derived from the above, the following order was preserved for the processing of the relevant systems:

1. express the relevant system in the form of tree criteria (in this case, only tree that corresponds to relevant system one is represented, because the remaining three are expressed identically).

2. make paired comparisons among the attributes to obtain the valuation in each dimension in order to generate a reciprocal square matrix (relations among weights w_i and w_j and judgments a_{ij} are given by $a_{ij} = w_i/w_j$, if the matrix w is a is a nonzero vector there is a λ_{max} of $Aw = \lambda_{max} w$).

3. obtain local priorities and to determine the consistency of the judgments by:

$$CI = \frac{(\lambda_{max} - n)}{(n-1)} \tag{1}$$

however, on having worked with several experts, the Geometric Consistency Index was used (GCI):

$$GCI = \frac{2\sum_{i<j} \ln a_{ij} - \ln \frac{Pi}{Pj}}{(N-1)(N-2)} \tag{2}$$

4. develop condensed matrix to integrate individual judgments among experts. In this sense, the geometric mean of the elements of the decision $a_{ij(k)}$ matrices was considering the weight w_k of each decision maker given multiple inputs:

$$c_{ij} = exp \frac{\sum_{k=1}^{N} w_k \ln a_{ij(k)}}{\sum_{K=1}^{N} w_k} \quad (3)$$

In addition, in order to reduce uncertainty among expert's responses, the consensus was given by:

$$S^* = \left[M - exp(H_{\alpha min})/exp(H_{\gamma max})\right]/\left[1 - exp(H_{\alpha min})/exp(H_{\gamma max})\right] \quad (4)$$

$$M = 1/\, exp(H_\beta)$$

where $H_{\alpha,\beta,\gamma}$ is α,β,γ from Shannon's entropy for the properties of all *K* participants. In contributions from Leleur (2012), Akten (2013), Battistoni *et al*. (2013), Jiang (2014) y De Felice *et al.* (2015), AHP it is used for reaching a decission. In this paper AHP was used to asses and verify concordance between Systems Thinking and reality, as well as to determine the consistency of the conceptual model. It is clarified that for the mathematical treatment of the data was sufficient the use of spreadsheets.

RESULTS

Ten matrices were processed for each relevant system and subsequently the aggregation of judgements was generated. Figure 2 shows the hierarchy of the system, it was found if the three criteria proposed are sufficient to enable the system meets its objective, as well as the consistency of the same. It is necessary to remember that, AHP stablishes that if the Consistency Ratio is smaller or equal to 10%, the inconsistency is acceptable. If the Consistency Ratio is greater than 10%, there must be corrections and revise the subjective judgment.

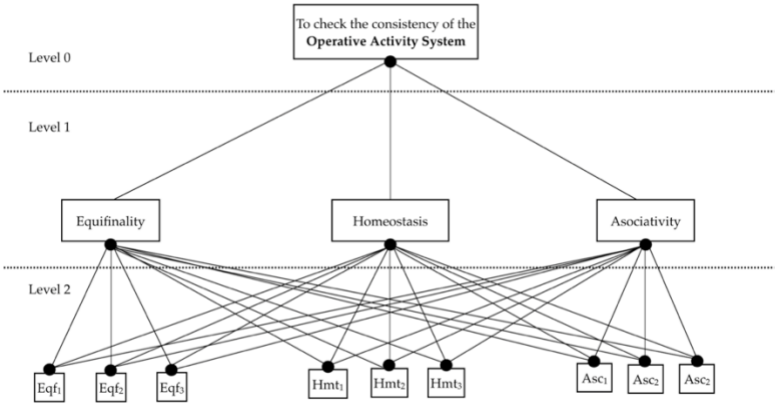

Figure 2. Hierarchical structure of the relevant system one

It is stressed that the consistency obtained through the hierarchical analysis, for each relevant system, was greater than 90%. This indicates that the dimensions and indicators that comprise each proposed system, have great relation with the objective expressed in the level 0 of the hierarchy and with the reality in which participating lodging SMEs operate. After applying the same process to all relevant systems, the table 2 presents the results for each one:

Table 2. Condensed matrices for each relevant system

AHP Structure		Lamda (λ)	GCI	Consistency Ratio (CR)
Level 0 (Objective): check consistency in relevant system 1: Operative activity	1	9.121	0.04	1.0%
Level 1 (criteria)	3	# Experts	Consensus	
Level 2 (subcriteria)	9	10	87.4%	Scale: AHP 1-9

(Column number)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	Normalized Principal Eigenvector	Ranking
Operative activity system										**1.0**	
I. Equifinality (Eqf)										**34.66%**	**
Eqf_1	1	1 1/2	1	1	2/3	7/8	1/1/5	1	1/1/3	11.54%	4
Eqf_2	2/3	1	8/9	1	6/7	1	1	1 1/4	1 1/3	10.55%	5
Eqf_3	1	1 1/9	1	1 3/5	7/9	3/4	1 2/3	1 1/2	1 5/9	12.57%	3
II. Homeostasis (Htm)										**39.02%**	*
Htm_1	1	1	5/8	1	7/9	4/7	1	1 1/2	1 2/5	10.14%	6
Htm_2	1 3/7	1 1/6	1 2/7	1 2/7	1	1	1 1/4	1 6/7	1 2/5	13.97%	2
Hmt_3	1 1/7	1	1 1/3	1 3/4	1	1	1 3/5	2 1/9	1 8/9	14.91%	1
III. Asociativity (Asc)										**26.33%**	***
Asc_1	5/6	1	3/5	1	4/5	5/8	1	1 2/7	1 5/8	10.09%	7
Asc_2	1	4/5	2/3	2/3	1/2	1/2	7/9	1	1 4/5	8.74%	8
Asc_3	3/4	3/4	2/3	5/7	5/7	1/2	3/5	5/9	1	7.50%	9

AHP Structure		Lamda (λ)	GCI	Consistency Ratio (CR)
Level 0 (Objective): check consistency in relevant system 2: Technical	1	9.128	0.04	1.1%
Level 1 (criteria)	3	# Experts	Consensus	
Level 2 (subcriteria)	9	10	88.1%	Scale: AHP 1-9

(Column number)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	Normalized Principal Eigenvector	Ranking
Technical system										**1.0**	
I. Teleology (Tlg)										**33.54%**	**
Tlg_1	1	1 1/9	1	6/7	6/7	2/3	8/9	4/5	1 1/7	10.08%	8
Tlg_2	8/9	1	1	1 1/3	1 1/3	1	4/5	1 1/9	1 1/2	12.05%	3
Tlg_3	1	1	1	1 1/7	1	2/3	1 1/4	1	1 1/2	11.41%	4
II. Feedback (Fd)										**36.86%**	*
Fd_1	1 1/6	3/4	7/8	1	1 1/4	5/7	1	1 3/7	1 1/6	11.24%	5
Fd_2	1 1/6	3/4	1 1/9	4/5	1	1	1 1/3	1 3/4	1 2/3	12.55%	2
Fd_3	1 1/2	1	1 1/2	1 2/5	1	1	1 1/8	1 1/4	1 1/6	13.07%	1
III. Organizational climate (Orc)										**29.61%**	***
Orc_1	1 1/9	1 1/4	4/5	1	3/4	8/9	1	1	1 3/5	11.15%	6
Orc_2	1 1/4	8/9	1	2/3	4/4	4/5	1	1	1 1/2	10.23%	7
Orc_3	7/8	2/3	2/3	6/7	3/5	6/7	5/8	2/3	1	8.23%	9

AHP Structure		Lamda (λ)	GCI	Consistency Ratio (CR)
Level 0 (Objective): check consistency in relevant system 3: Control & Monitoring	1	9.072	0.02	0.6%
Level 1 (criteria)	3	# Experts	Consensus	
Level 2 (subcriteria)	9	10	87.5%	Scale: AHP 1-9

(Column number)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	Normalized Principal Eigenvector	Ranking
Control & monitoring system										**1.0**	
I. Coordination (Crd)										**36.60%**	**
Crd_1	1	1 4/7	6/7	1 1/5	5/6	4/5	1 1/3	1 1/6	1 3/8	11.97%	4
Crd_2	5/8	1	8/9	1	8/9	5/6	1	1 1/5	1 1/2	10.56%	6
Crd_3	1 1/6	1 1/9	1	1 2/5	1	1 1/9	1 2/3	1 2/3	1 7/9	14.07%	1
II. Recurrency (Rec)										**38.47%**	*
Rec_1	5/6	1	5/7	1	1 1/9	4/5	1 5/7	1 1/2	1 2/5	11.86%	5
Rec_2	1 1/5	1 1/9	1	8/9	1	1 1/5	1 1/2	1 3/4	2	13.49%	2
Rec_3	1 1/4	1 1/5	8/9	1 2/9	5/6	1	1 2/5	1 1/3	2 2/9	13.12%	3
III. Control (Ctrl)										**24.93%**	***
$Ctrl_1$	3/4	1	3/5	3/5	2/3	5/7	1	1	1 1/2	8.87%	8
$Ctrl_2$	6/7	5/6	3/5	2/3	4/7	3/4	1	1	1 1/2	9.07%	7
$Ctrl_3$	3/4	2/3	5/9	5/7	1/2	4/9	2/3	2/3	1	6.99%	9

AHP Structure		Lamda (λ)	GCI	Consistency Ratio (CR)
Level 0 (Objective): check consistency in relevant system 4: Management & planning	1	9.135	0.04	1.2%
Level 1 (criteria)	3	# Experts	Consensus	
Level 2 (subcriteria)	9	10	91.8%	Scale: AHP 1-9

(Column number)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	Normalized Principal Eigenvector	Ranking
Management & planning system										**1.0**	
I. Autopoiesis (Atp)										**36.11%**	*
Atp_1	1	1 1/4	7/8	1	3/4	3/4	8/9	1 1/7	1	10.45%	6
Atp_2	4/5	1	1 1/2	1 3/7	1 1/2	1 1/3	1 1/4	1 3/7	1 3/4	14.37%	1
Atp_3	1 1/7	2/3	1	1 3/8	1	7/8	5/6	1 1/9	1 5/9	11.29%	5
II. Mutualist symbiosis (Msb)										**36.02%**	**
Msb_1	1	2/3	3/4	1	1 3/7	5/6	1 1/8	1 3/8	1 1/3	11.30%	4
Msb_2	1 1/3	2/3	1	2/3	1	1	1 2/3	1 1/4		11.41%	3
Msb_3	1 3/8	3/4	1 1/7	1 1/5	1	1	1 1/2	1 8/9	1 3/7	13.31%	2
III. Decision-making process (Dmp)										**27.88%**	***
Dmp_1	1 1/9	4/5	1 1/5	8/9	1	2/3	1	1	1	10.32%	7
Dmp_2	7/8	2/3	8/9	3/4	3/5	1/2	1	1	1 3/8	8.95%	8
Dmp_3	1	4/7	2/3	3/4	4/5	2/3	1	3/4	1	8.61%	9

For relevant system 1, the dimension homeostasis is obtained major weight, the weights obtained here reflect the need to consider actions aimed to preserve the structure and cohesion of the operating units within established limits, seeking the emergency of balance and self-regulation. Therefore, the information generated by performance assessment must influence in interdepartmental communication. The second dimension in relevance is the equifinality. Related to this, human capital managers consider that essential activities must be interconnected consistently to the purpose of the company, which is far from the current context of participating SMEs. In addition, organisational objectives should emanate from the relation among operational units and its control and management elements, without neglecting adaptive processes and learning. In regard to the associativity, is denoted the

importance of moving toward a dynamic of continuous cooperativity. The consensus among the experts was 87%, this result guarantees the relevance and correspondence of system one.

Results for relevant system 2 indicate a strong relationship among its dimensions and a consensus of 88%, among experts, reinforces the appropriateness of the proposed system. The feedback was the dimension with greater weight, this granted to assess whether the treatment of information that results from the interactions of the system can enrich both to the HCM as to the working groups. It is stressed that the respondents established a symbiotic relationship between the expression and implementation of purposes for the system, and they agree to make the available infrastructure, efficient and communicate the results to equilibrate the whole.

The data obtained for the teleology dimension indicate that modalities to act at all organisational levels should be reconsidered, as well as communicate the adoption of strategies to properly engage working groups. Respondents also agree that it is necessary have information that contributes to the sustained system performance. It can be inferred that organisational climate dimension nests the previous two dimensions, it is to say, so that it exists a suitable conflict management there must be norms, values and an appropriate relation between teleology and feedback.

The results of the system 3 indicate that the order of its relations is coherent and fits the vision that the experts possess on the environment in which they operate. The fundamental to this system is the recurrence, that the HCM generates relations and conditions for the organisation to return arbitrarily to a state, the closest to the previous of stability. The second dimension highlights the need to generate symmetries organisational to improve the response capacity and adaptability of the components of the system, without leaving aside the purposes clearly established.

For system 4, the values obtained do not show a significant separation, this determines the interdependence between the elements of this system. Experts prioritized the autopoiesis dimension (36.1%) since, in the structure of lodging SMEs, was not identified a component that governs the rest of the subsystems. Therefore, it is necessary to have an actor that leads the whole system towards a learning process that allows development at all levels and induce stability and autonomy. Regarding to mutualist symbiosis, experts agree that the current process for deciding does not include the actors at every level of the organisational structure; this explains the difficulty to implement adaptive processes. In that sense, learning is essential for to reconcile social and technical attributes.

CONCLUSIONS

1-The review of some models to manage human capital, granted to identify their centralist tendency and some omissions such as: relations with the environment, modeling problems, pursue a viable equilibrium or the transcendence of the whole system. The foregoing opens up areas of opportunity to propose a model of HCM in lodging SMEs, that often import management models from large enterprises.

2-The application of the Systemic Approach allowed to characterize and diagnose the problem situation, combining points of view of different experts. The adoption of this approach also granted to establish the design of a model to manage the human capital in lodging SMEs that emerged from a series of relevant systems and considers aspects, such as management functions, the organisation, social and technical elements, economics elements and the environment.

3-The use of the Soft Systems Methodology turned out in the identification of relevant actors in the problem situation, place them on a recursion level and recognize the conflictual relations and direct efforts to the dissolution of the same. The incorporation of the Analytic Hierarchy Process provided mathematical reliability and granted to check the proposed relations. In that order, it is considered that the relevant systems contribute to the management of human capital in lodging SMEs and they are consistent with the reality in which experts operate, it is to say, the functions and relations proposed for the model are accepted by those who manage the human capital.

4-Based in the general values obtained for the model, it is possible to say that this construct consider heterogeneity in Human Activity Systems such as lodging SMEs, and does not opt for the subordination of a function or department, but it seeks to generate units sufficiently autonomous as not to neglect the symbiosis and synergy that should prevail in the structure of the whole, in order to influence the emergence of capacities for self-organisation of the company, without separating the socio-technical elements.

Finally, it can be said that this work aims to contribute in matters, related to the human capital management in lodging or tourist SMEs, as well as helping the construction of solutions in this kind of systems.

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